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PREDICTING FUNCTIONAL VERSUS ORGANIC PSYCHOTIC DIAGNOSES OF HOSPITALIZED NAVY PERSONNEL

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Predicting Functional versus Organic Psychotic Diagnoses
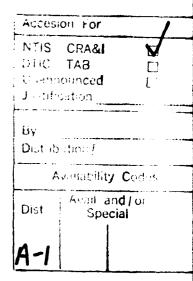of Hospitalized Navy Personnel

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Summary

Problem

Psychotic disorders, while fewer in number than nonpsychotic disorders among active duty, enlisted Navy personnel, are relatively costly to the U.S. Navy. An important question is whether psychotic disorders are in some sense predictable. If so, which enlisted individuals in the U.S. Navy are at greater risk to experience a psychotic breakdown and to be subsequently hospitalized? The answers to these questions could provide both considerable cost savings and immeasurable savings in human suffering.

Objective

The purpose of the study reported herein was to examine the relationship between type of psychotic diagnosis at time of hospitalization, pre-Navy psychotic condition, and paygrade for active duty, enlisted Navy personnel.

Approach

The sample (N=3,130) consisted of all hospitalized cases of active duty, enlisted Navy personnel between 1981 and 1984, inclusive, with a primary diagnosis of either an organic or a functional psychosis.

Results

Results indicated that functional psychoses were more prevalent than organic psychoses and more likely associated with a pre-Navy psychotic condition and lower paygrade levels. This was most true of schizophrenia. There was a decreasing trend across paygrades for functional psychoses in general and schizophrenic disorders in particular to be associated with a pre-Navy psychotic condition.

Conclusions

Active duty, enlisted Navy personnel with a pre-Navy history of some functional psychotic disorder are at risk of being hospitalized for that problem after they join the Navy. Distinguishing between process versus reactive psychosis at time of recruitment and at time of hospitalization within the U.S. Navy could provide substantial savings to the U.S. Navy.

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Predicting Functional versus Organic Psychotic Diagnoses
of Hospitalized Navy Personnel

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Introduction

Considerable empirical research indicates that psychotic disorders in the civilian sector are more likely than other mental disorders to be severe, chronic, and to involve extended institutionalization (Antonovsky, 1983; Diagnostic and Statistical Manual of Mental Disorders [DSM-III-R], 1987; Lehman, Haroutun, Babigian, & Reed, 1984; Manderscheid & Barrett, 1987; Mattes, 1982; Munves, Trimboli, & North, 1983). There is also empirical evidence that psychotic disorders within the U.S. Navy are more likely to involve longer hospital stays and to result in a disability discharge from the service (Kilbourne, Hilton, & Goodman, in press; Kilbourne, Goodman, & Hilton, in press). Thus, psychotic disorders, while fewer in number than nonpsychotic disorders among active duty, enlisted Navy personnel, are relatively costly to the U.S. Navy.

An important question is whether psychotic disorders are in some sense predictable. If so, which enlisted individuals in the U.S. Navy are at greater risk to experience a psychotic breakdown and to be subsequently hospitalized? The answers to these questions could provide both considerable cost savings and immeasurable savings in human suffering.

Psychosis is not a single and uniform disability. Psychotic symptoms are included in several mental disorders, such as schizophrenia, mood disorder, delusional disorder, and certain organic mental disorders. A useful distinction in attempting to predict type of psychoses is to contrast organic versus functional psychoses. Organic disorders are disturbances that are known to be caused by either transient or permanent changes in the structure of an organ (e.g., the nervous system). (The Diagnostic and Statistical Manual of Mental Disorders [Third Edition-Revised, 1987] distinguishes between organic mental disorders with and without reference to specific etiology.) Organic psychoses in the U.S. Navy are probably associated with some kind of sustained physical

injury and are less likely than functional psychoses to have existed prior to military service. Functional disorders, on the other hand, are disturbances that cannot be linked to structural changes in a particular organ, and are sometimes psychogenic in origin (i.e., attributable to some psychological or emotional factors). More importantly, functional psychoses are generally characterized by both a longstanding maladaptive pattern and by the absence of a clear biological component.

Studies indicate, for example, that any individual diagnosed as schizophrenic (i.e., a functional psychosis) is at risk of becoming chronically mentally ill and that about 20% of those diagnosed with an affective disorder (also a functional disorder) are similarly at risk (Manderscheid & Barrett, 1987). While preexisting psychopathology and severe stressors are oftentimes associated with psychotic reactions, there is also some evidence that schizophrenia, delusional disorder, major depression, and bipolar disorder (all functional psychoses) are more common among the offspring of parents with these disorders and are influenced by early family experiences (DSM-III-R, 1987).

The purpose of the study reported herein was to examine the relationship between type of psychotic diagnosis at time of hospitalization, pre-Navy psychotic condition, and paygrade for active duty, enlisted Navy personnel. It was hypothesized that functional as opposed to organic psychoses at time of hospitalization would be associated with a pre-Navy psychotic condition and lower paygrade levels. It was also hypothesized that, among the various psychotic disorders, schizophrenic disorders would be most likely to indicate the above pattern.

Methods

Subjects

The sample (N=3,130) consisted of all hospitalized cases of active duty, enlisted Navy personnel between 1981 and 1984, inclusive, with a primary diagnosis of either an organic or a functional psychosis. The organic psychoses, which included organic diagnoses with psychotic features, were: senile and presenile dementia, alcoholic psychosis, psychosis associated with intracranial infection, psychosis associated with other cerebral conditions, and psychosis associated with other physical conditions. The functional psychoses were: schizophrenia, affective psychosis, paranoid states, other psychosis,

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and unspecified psychosis. The majority of the sample was white (74%), male (92%), married (57%), and had twelve years of education (69%). The mean age was 24.4 (sd=5.5, range=17-52 years). The median paygrade was E-3 (range=E-1 to E-9); 21% of the sample were E-1, 59% were E-2 to E-4, 16% were E-5 to E-6, and 4% were E-7 to E-9. The diagnoses were 14% organic psychoses and 86% functional psychoses.

Procedures

Data Collection Procedures. Data were obtained from the Navy Enlisted Career/Medical History File (NECMHF). NECMHF is based on two compiled files. One is the Service History File, which consists of demographic and military-service history data from Navy Military Personnel Command in Arlington, Virginia. The other is the Medical History File, which contains hospitalization, death, Medical Board action, and Physical Evaluation Board action data from Naval Medical Data Services Center in Bethesda, Maryland. NECMHF is compiled and maintained by the Naval Health Research Center, San Diego, California (Garland, Helmkamp, Gunderson, Gorham, Miller, McNally, & Thompson, 1987).

Coding Procedures. Type of psychotic primary diagnosis at time of hospitalization was treated as an ordinal variable (organic psychosis [more likely to involve a biological component] versus functional psychosis [less likely]). Pre-Navy psychotic condition was extracted from the patient's admission record, and indicated whether the condition for which the patient was admitted to the hospital existed prior to entry into the service. Since data only indicated whether the condition for which the patient was admitted existed prior to entry into the Navy, and not the duration or frequency of the prior condition, pre-Navy psychotic condition was treated as an ordinal variable (no pre-Navy psychotic condition versus some pre-Navy psychotic condition). Paygrade was also treated as an ordinal variable (E-1, E-2 to E-4, E-5 to E-6, and E-7 to E-9). A control variable--admission history of mental problem primary diagnoses at time of hospitalization (first-admission case versus multiple-admission case)--was treated as a categorical variable.

Results

An initial inspection of the data indicated that functional psychoses, as opposed to organic psychoses, were more prevalent and more likely to be associated with some pre-Navy psychotic condition. Table 1 shows the frequency

distribution of each type of psychotic diagnosis and the percentage indicating a pre-Navy psychotic condition.

Table 1

Distribution of Psychotic Diagnoses

Psychotic Diagnosis	n	% of All Psychotic Disorders	% of Each Disorder with a Pre-Navy Psychotic Condition
Organic			
Senile and Presenile Dementia	2	.1	0
Alcoholic Psychosis	217	6.9	4.6
Psychosis Associated with Intracranial Infection	0	0	--
Psychosis Associated with Other Cerebral Conditions	11	.4	27.3
Psychosis Associated with Other Physical Conditions	197	6.3	8.1
Functional			
Schizophrenia	1,413	45.1	32.8
Affective Psychosis	656	21.0	21.6
Paranoid States	86	2.7	12.8
Other Psychosis	306	9.8	8.5
Unspecified Psychosis	242	7.7	10.7
All Psychotic Diagnoses	3,130	100.0	22.4

An analysis of the cross-tabular frequency distributions of type of psy-
choses (i.e., organic versus functional) by pre-Navy psychotic condition and
paygrade revealed significant relationships among these variables (the p val-
ues for all chi square tests were $\leq.0001$). The proportional reductions of
error (Kendall's tau-b)[2] in predicting psychotic diagnosis from each of the
predictor variables were significant (p<.0001). Knowledge of pre-Navy psy-
chotic condition alone would reduce the errors in predicting type of psychotic
diagnosis by 15%, while knowledge of paygrade alone would reduce prediction
errors by 13%.

Using the partial tau-b procedure (Agresti & Agresti, 1979; Blalock,
1979), both predictor variables remained essentially statistically independent
of admission history (first-admission case versus multiple-admission case).
However, the tau-b analysis indicated a significant interaction between the
two predictor variables and type of psychosis. The relationship between type
of psychosis and pre-Navy psychotic condition was reduced by 47% when con-
trolling for paygrade ($\bar{t}_b=.08$). The relationship between type of psychosis
and paygrade was reduced by 15% when controlling for pre-Navy psychotic
condition ($\bar{t}_b=-.11$).[3] Table 2 shows the interaction between the two predictor
variables and type of psychosis.

A close inspection of the partial-association tables clarified the nature
of the interaction. Functional psychoses as opposed to organic psychoses were
more likely associated with a pre-Navy psychotic condition and lower paygrade
levels. For example, approximately 44% of the E-1s with a functional psycho-
tic diagnosis also indicated a pre-Navy psychotic condition. At the other end
of the continuum, and in marked contrast to lower paygrades, only 4% of the
E-7s to E-9s with a functional psychotic diagnosis also indicated a pre-Navy
psychotic condition. Thus, there was a decreasing trend across paygrades for
functional psychotic diagnoses to be associated with a pre-Navy psychotic con-
dition (see Table 3).

Psychotic diagnoses data were then recoded as schizophrenic versus all
other psychotic diagnoses. An analysis of the cross-tabular frequency distri-
butions of schizophrenic diagnosis by pre-Navy psychotic condition and pay-
grade revealed significant relationships among these variables (the p values
for all chi square tests were $\leq.0001$). The proportional reductions of error
(Kendall's tau-b) in predicting schizophrenic diagnosis from each of the pre-

Table 2

Effect of Control Variables on Relationships of
Type of Psychotic Diagnosis with Predictor Variables[a]

	Type of Psychotic Diagnosis (Organic, Functional)	Control Variables		
		Pre-Navy Psychotic Condition	Paygrade	Admission History
Pre-Navy Psychotic Condition (None, Some)	.15	--	.08	.13
Paygrade (Low, High)	-.13	-.11	--	-.13

[a]All table values represent tau-b coefficients of Type of Psychotic Diagnosis (organic versus functional) with the row (predictor) variables.

Table 3

Percent of Psychotic Diagnoses Across Paygrades
with a Pre-Navy Psychotic Condition
(Functional and Organic)

Paygrade Level	n	% of Disorder with a Pre-Navy Psychotic Condition
E-1		
Functional Psychoses	613	43.7
Organic Psychoses	43	11.6
E-2 to E-4		
Functional Psychoses	1596	22.1
Organic Psychoses	250	7.2
E-5 to E-6		
Functional Psychoses	401	11.2
Organic Psychoses	104	3.8
E-7 to E-9		
Functional Psychoses	83	3.6
Organic Psychoses	26	7.7

dictor variables were significant ($p<.0001$). Knowledge of pre-Navy psychotic condition alone would reduce the errors in predicting schizophrenic diagnosis by 23%, while knowledge of paygrade alone would reduce prediction errors by 20%.

Using the partial tau-b procedure, (Agresti & Agresti, 1979; Blalock, 1979), both predictor variables remained relatively independent of admission history. However, the relationship between a diagnosis of schizophrenia and pre-Navy psychotic condition was reduced by 26% when controlling for paygrade ($\bar{t}_b=.17$). The relationship between a diagnosis of schizophrenia and paygrade was reduced by 30% when controlling for pre-Navy psychotic condition ($\bar{t}_b= -.14$).[4] Table 4 shows the interaction between the two predictor variables and schizophrenia versus all other psychotic diagnoses.

Thus, the same interaction emerged between the two predictor variables and diagnosis of schizophrenia, although the effects were stronger when comparing schizophrenia versus all other psychotic diagnoses than when comparing functional versus organic psychotic diagnoses. A diagnosis of schizophrenia was more likely than all other psychotic diagnoses combined to be associated with a pre-Navy psychotic condition and lower paygrade levels. For example, 52% of the E-1s with a diagnosis of schizophrenia also had a pre-Navy psychotic condition. At the other end of the continuum, and in marked contrast to the pattern of lower paygrades, only 10% of the E-7s to E-9s with a diagnosis of schizophrenia also indicated a pre-Navy psychotic condition. Thus, there was a decreasing trend across paygrades for schizophrenic diagnoses to be associated with a pre-Navy psychotic condition (see Table 5).

Discussion

Both hypotheses were supported in the present study. Functional as opposed to organic psychotic diagnoses at time of hospitalization were more likely to be associated with a pre-Navy psychotic condition (i.e., a diagnosed condition for which the patient was admitted to the hospital and which existed prior to entry into the service) and with lower paygrades (especially E-1s). A schizophrenic diagnosis (the most prevalent psychotic diagnosis [45%]), as opposed to all other psychotic diagnoses combined, was most representative of this pattern. There was a decreasing trend across paygrades for functional

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Table 4

Effect of Control Variables on Relationships of Schizophrenic Diagnosis with Predictor Variables[a]

| | Schizophrenic Diagnosis (No, Yes) | Control Variables | | |
		Pre-Navy Psychotic Condition	Paygrade	Admission History
Pre-Navy Psychotic Condition (None, Some)	.23	--	.17	.21
Paygrade (Low, High)	-.20	-.14	--	-.21

[a]All table values represent tau-b coefficients of Schizophrenic Diagnosis versus all other psychotic diagnoses combined with the row (predictor) variables.

Table 5

Percentage of Schizophrenic Diagnoses Across Paygrades with a Pre-Navy Schizophrenic Condition

Paygrade Level	n	% of Each Disorder with a Pre-Navy Psychotic Condition
E-1		
Schizophrenic	378	52.0
All other psychoses	278	28.0
E-2 to E-4		
Schizophrenic	881	27.1
All other psychoses	965	13.6
E-5 to E-6		
Schizophrenic	140	19.3
All other psychoses	365	6.0
E-7 to E-9		
Schizophrenic	10	10.0
All other psychoses	99	4.0

psychotic diagnoses in general, and schizophrenic diagnoses in particular, to be associated with a pre-Navy psychotic condition.

It is important to keep in mind that the present study examined only hospitalized psychotic cases; individuals with a pre-Navy psychotic condition who were not hospitalized with a mental disorder as the primary diagnosis during the time period of the study were not identifiable for comparative analysis. Nevertheless, these findings have important implications. First, the obtained pattern of results suggests that active duty, enlisted Navy personnel with a pre-Navy history of some functional psychotic disorder, especially schizophrenia, are at risk of being hospitalized for that problem after they join the U.S. Navy. Such individuals were disproportionately represented in the lower paygrade levels (e.g., E-1s constituted 21% of the present sample and only 6% of the total Navy population). A selection factor appears to be operating, in that individuals with a pre-Navy psychotic condition are hospitalized early in their Navy careers and are probably more likely than those with no pre-Navy psychotic condition to be discharged from the Navy. Therefore, fewer in number remain at higher paygrade levels. Given their elevated risk of hospitalization, the high cost of training (about $18,000 per recruit), and the relatively high cost of treatment and/or premature discharge from the Navy, it would seem cost-beneficial to screen out individuals with a history of functional psychosis, especially schizophrenia, at the time of recruitment.[5] Such individuals need psychiatric treatment more than training, and could be more humanely and effectively treated in the private sector.

The second implication of the present study concerns the nature of psychotic disorders that affect active duty, enlisted Navy personnel. More than 85% of all psychotic diagnoses at time of hospitalization were functional, some of these were chronic (i.e., a prior psychotic history for the hospitalized condition) and some were situational (by implication). Chronic, functional psychoses were more likely at the lower paygrade levels. This pattern was especially true for schizophrenia. Still, non-chronic, functional psychoses (75%) were more prevalent overall than chronic, functional psychoses (25%), and were disproportionately represented at the higher paygrade levels E-7 to E-9.

The above pattern among the functional psychotic disorders--both chronic and non-chronic incidences at lower paygrades, and primarily non-chronic incidences at higher paygrades--implies a dichotomy which is important clinically.

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It suggests the value of a dimensional approach when diagnosing functional psychoses in the U.S. Navy. A dimensional approach makes a distinction between reactive and process psychosis. The best-known dimensional approach distinguishes between reactive and process types of schizophrenia. Reactive schizophrenia is characterized by an abrupt onset, some precipitating environmental stressor, normal premorbid adjustment, and depressed or anxious mood. Process schizophrenia, on the other hand, is characterized by a gradual onset, typically occurring during childhood or adolescence, no precipitating event, blunt affect, bizarre delusions, and poor premorbid social development. Reactive schizophrenia has a much better prognosis than process schizophrenia.

Distinguishing between process versus reactive psychoses at time of recruitment and at time of hospitalization could provide considerable savings to the U.S. Navy. An individual with a history of a process psychosis at time of recruitment is at risk for both hospitalization while in the U.S. Navy and for disability discharge from the U.S. Navy. An individual with a history of process psychosis at time of hospitalization within the U.S. Navy is at risk for future hospitalizations and disability discharge from the U.S. Navy.

Footnotes

[1] Brock Kilbourne is a research associate with the National Research Council, National Academy of Sciences, and a licensed psychologist (CA. #PV10467). Jerry Goodman is a sociologist and statistical consultant with the Naval Health Research Center, San Diego, CA. Susan Hilton is a research psychologist and a member of the Health Services Research Department, Naval Health Research Center.

[2] Kendall's tau-b has a proportional reduction in error interpretation and can be used to compute a summary partial tau-b measure ($\bar{\tau}_b$=tau-b-bar) to control for third variables of any scale (Agresti & Agresti, 1979).

[3] A logit analysis (a multidimensional nonparametric analysis), which permitted the assessment of simultaneous effects of different variables on a dichotomous dependent variable (functional versus organic psychoses), obtained the same results when length of service was treated as a covariate.

[4] A logit analysis (similar to that in Note 3) of schizophrenic versus all other psychoses, which treated length of service as a convariate, essentially obtained the same results.

[5] Inasmuch as functional psychoses are more common among persons who are offspring of persons with such disorders, family history of such disorders may be an appropriate factor in deciding marginal recruitment cases.

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19 ABSTRACT (Continue on reverse if necessary and identify by block number)

Psychotic disorders, while fewer in number than nonpsychotic disorders among active duty, enlisted Navy personnel, are relatively costly to the U.S. Navy. The purpose of the study reported herein was to examine the relationship between pre-Navy psychotic condition, paygrade, and type of psychotic diagnosis at time of hospitalization for active duty, enlisted Navy personnel. The sample (N=3,130) consisted of all hospitalized cases of active duty, enlisted Navy personnel between 1981 and 1984, inclusive, with a primary diagnosis of either an organic or a functional psychosis. Results indicated that functional psychoses were more prevalent than organic psychoses and more likely associated with a pre-Navy psychotic condition and lower paygrades. This was most true of schizophrenia. Active duty, enlisted Navy personnel with a pre-Navy history of some functional psychotic disorder are at risk of being hospitalized for that problem after they join the Navy. Distinguishing between process versus reactive psychosis at time of recruitment and at time of hospitalization within the U.S. Navy could provide substantial savings to the U.S. Navy.

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